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This paper contends that developments in both TBMs and US JTMD forces have affected the operational factors of space and time to such a degree that current US doctrine for JTMD is rendered obsolete. Without complete integration of JTMD forces across all services, future JFCs will achieve similar JTMD results to those achieved during the Gulf War. Significant change to US JTMD doctrine is required, change that will bring synchronization to JTMD operations and enable JTMD mission accomplishment and provide the JFC with considerable benefits with respect to all of the operational functions.

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Overcoming Space and Time Disadvantages in Joint Theater Missile Defense

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A paper submitted to the Faculty of the U.S. Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

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Abstract

Overcoming Space and Time Disadvantages in Joint Theater Missile Defense

The Gulf War was the first time that a US Joint Force Commander (JFC) confronted tactical ballistic missiles (TBM) in combat. Consequently, the US was ill prepared for the Iraqi Scud threat and achieved only minimal success against it. As the entire world watched, Saddam Hussein's employment of Scuds clearly displayed the strategic nature of TBMs. Iraq nearly destroyed the fragile coalition that the US had arrayed against it, while the US expended enormous energy and resources to little avail. Despite the US's poor results against Iraqi Scuds, current US Joint Theater Missile Defense (JTMD) doctrine still reflects the concepts employed during the Gulf War. The US is relying on technological advancements in active defense systems and command and control infrastructure to enable success in future JTMD operations. While significant improvements to US JTMD forces have been made since the Gulf War, our potential enemies have also enhanced their tactical ballistic missile forces.

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Introduction

Tactical Ballistic Missiles (TBM) of today have far greater range, accuracy, and lethality than those the US has faced in the past. TBMs are strategic weapons that produce strategic results if not adequately defended against. To combat this modern threat, Joint Force Commanders (JFC) require complete integration of Joint Theater Missile Defense (JTMD) forces along with centralized command and control of JTMD forces at the operational level. Synchronization of operational functions and the four operational elements (Attack Operations, Active Defense, Passive Defense and Command, Control, Communication, Computers and Intelligence (C4I)) of JTMD is paramount to success. Only through such synchronization can the JFC favorably influence the operational factors of space, time, and forces and enable JTMD mission accomplishment. Current US JTMD doctrine is modeled after the Gulf War threat, but advancements in both TBMs and US JTMD capabilities have significantly altered the future battle space in terms of space and time. Our current doctrine does not compensate for this sizeable change in the operational factors, lacks integration of the operational elements of JTMD, and therefore, gives a distinct advantage to our potential enemies.

Today, JFC staffs are wrestling with operational concepts to better integrate the services as well as the four operational elements or "pillars" of JTMD. This paper will consider the effects of technological advancements in TBMs and US JTMD capabilities on the operational factors of space, time, and forces as they apply to current US JTMD doctrine. Within this context, I will attempt to identify shortfalls in the current doctrine and propose a solution that provides freedom of action to the JFC with regard to TBMs. The extensive proliferation of TBMs has made it likely that future enemies of the United States will possess

formidable TBM capabilities. Success in defeating this TBM threat will require joint doctrine that leverages technological developments in JTMD, integrates the military services, and facilitates synchronization.

Gulf War Assessment

The history of TBM use has its origins in World War II. The German use of the Nazi Vergeltungswaffen 2 (V2) during the last two months of the war in Europe was the first recorded wartime employment of TBMs.[1] While the V2 was a primitive ballistic missile by today's standards, its application against urban targets caused great concern and presented quite a challenge for the political and military leaders of the Grand Alliance. The Soviet Union recognized the strategic value of the V2, and using German designs, began development of TBMs shortly after World War II. The result was the Scud missile. The Soviet Scud missile was deployed extensively throughout Eastern Europe during the Cold War. Over time, the Scud has found its way into the hands of regional belligerents around the world, particularly in the Middle East. During the October 1973 War against Israel, Egypt became the first country to use Scud missiles in combat. The most extensive use of Scud missiles occurred during the Iran-Iraq war. Collectively, Iran and Iraq fired more than 600 TBMs at each other from 1980-1988.[2] Although the wartime use of TBMs rose significantly in the latter part of the 20th century, the Gulf War was the first time that modern day western military commanders confronted an opponent who possessed both TBMs and a propensity to employ them.

United States military commanders thought the inaccuracy of Iraqi Scud missiles made the weapon militarily inconsequential, and hence, gave little attention to the Iraqi Scud threat during the planning and early stages of the war. The initial US response to the Scud

threat consisted of the deployment of the Patriot air defense system to protect critical coalition assets and the inclusion of fixed TBM launch sites and production facilities in the coalition target list. However after Iraq began firing its TBMs, US military leadership was made keenly aware of the political and strategic value of Saddam Hussein's Scud missiles. Under specific guidance from the National Command Authority (NCA), US Central Command undertook intense efforts to locate and destroy Iraqi mobile Scud missile launchers, and Patriot missile batteries were rapidly deployed to Israel. These responses drew enormous time and resources from the overall coalition effort. Iraq's ability to emplace, fire and relocate in under 30 minutes made for difficult targeting. Special Operations Forces (SOF) were inserted into Western Iraq to perform reconnaissance, surveillance and targeting. "Scud Boxes", otherwise known as Restricted Operations Areas (ROA), were established over known Scud firing locations and patrolled by coalition strike aircraft 24 hours per day. This strategy, commonly referred to as "The Great Scud Hunt", required the dedication on an entire squadron of 24 aircraft as well as precious air-to-air refueling assets.[3]

Post war claims of coalition success in neutralizing and destroying Iraq's Scud threat were common. The US Army initially claimed that the Patriot missile system had shot down 80% of the TBMs fired at Saudi Arabia and 50% of the TBMs fired at Israel.[4] United States Air Force officials reported that several enemy mobile launchers were destroyed in the deserts of Western Iraq. Yet after detailed analysis of Patriot performance during the Gulf War and comprehensive post-war battle damage assessment of Iraq's Scud forces, our initial claims of success seem grossly exaggerated. The Army now believes, "that as many as 52 percent of the Scuds were destroyed overall, but it only has high confidence that the Patriot

destroyed 25 percent of the Scud warheads it targeted."[5] Still, the General Accounting Office (GAO) does not agree. The GAO states that, "a strong case can be made that Patriots hit only about 9 percent of the Scud warheads engaged, and there are serious questions about these few hits."[6] Similarly, it now appears that the "The Great Scud Hunt" did not produce the success initially claimed. While coalition aircraft were effective in disrupting Scud firing operations, there is no evidence that a single mobile launcher was destroyed. Most of the claimed "kills" appear to have been decoys.[7] Overall, "Air Force and special operations missions to find and destroy Iraq's Scud missiles and their launchers met with no better success than the World War II effort (Operation Crossbow) to locate and hit the Nazi V-2 launch sites."[8] In fact, Iraq's Scud missile firing only stopped when coalition ground forces occupied Southern Iraq, reminiscent of how the allies eventually stopped Germany's V2 firing during World War II.

Tactical *Ballistic Missiles Are* Strategic

Iraq's use of Scud missiles during the Gulf War provided four significant lessons to the world that watched. First, as predicted by many western military commanders, the Scud missiles were highly inaccurate and militarily insignificant. Second, western militaries possessed little to no defensive capability against TBMs. Third, Iraqi Scuds proved extremely illusive. While the coalition expended enormous amounts of energy with highly technical sensors and weaponry attempting to suppress and destroy Scud missiles and launchers, they met with little success. Lastly, and most importantly, Iraq's use of TBMs, while tactically and operationally ineffective, was strategically successful. As General Ronald Fogleman, former Chief of Staff of the United States Air Force expressed, "Using low-tech Scud missiles, Saddam Hussein threatened the cohesion of the coalition, affected

our planning for combat operations, and killed 28 troops in an attack on a barracks in Dhahran."[9] Through the use of Scuds, Saddam Hussein came very close to drawing Israel into the war and destroying the fragile coalition arrayed against him.

The strategic nature of TBMs combined with their relatively low cost make them an attractive weapon to developing nations around the world. As the 1998 Commission to Assess the Ballistic Missile Threat to the United States observed:

> Ballistic missiles provide a cost-effective delivery system that can be used for both conventional and non-conventional weapons. For those seeking to thwart the projection of US power, the capability to combine ballistic missiles with weapons of mass destruction provides a strategic counter to US conventional and information-based military superiority.[10]

TBMs provide a capability of penetrating deep into enemy territory, threatening population centers and dissuading potential coalition members from providing support. Perhaps their greatest value is in coercion. As General Fogleman noted, "Simply the threat of such enemy missile attacks might deter the US and coalition partners from responding to aggression in the first place."[11] When a TBM capability is combined with weapons of mass destruction (WMD) the strategic significance of TBMs is exponentially increased.

Current Doctrine for US Forces

Current US doctrine for Joint Theater Missile Defense (JTMD) is articulated in Joint Pub 3-01.5, Doctrine for Joint Theater Missile Defense, and is supported by individual service doctrine and concept plans. Current doctrine is a reflection of the US military's Gulf War experience and has developed little conceptually from the point defense by Patriot and the "Scud boxes" used to counter Iraqi Scuds. Essentially the Department of Defense (DOD) has codified the JTMD procedures that proved unsuccessful during the Gulf War. The major

problem with the US approach, as observed by Mr. Charles Pena of the Cato Institute, is that it is structured for and focused on the "here and now" threat.[12]

Current JTMD doctrine is organized into four operational elements or "pillars": passive defense, active defense, attack operations, and C4I. Passive defensive operations include actions taken by US forces to deny effective targeting and minimize effects of missile attacks. Active defense applies to operations initiated after TBM launch to destroy TBMs in flight. Attack operations destroy, disrupt, or neutralize TBM launch platforms and their supporting infrastructure. C4I refers to the integration of intelligence, sensors, weapons platforms, and ground stations that enable commanders to effectively prosecute JTMD operations. US JTMD doctrine definitively states, "This threat [TBM] can only be countered by the synergistic performance achieved by coordinating and integrating all four operational elements."[13] Joint doctrine calls for centralized planning and decentralized execution in order to realize this desired synergy, yet the same joint doctrine distinctly assigns responsibility for each "pillar", with the exception of C4I; doctrine assumes that JTMD forces will utilize existing joint architectures. Passive defense is delegated to Component Commanders. Active defense is assigned to the Area Air Defense Commander (AADC), and attack operations are assigned to the Joint Force Air Component Commander (JFACC). Integration of the four pillars of JTMD is discussed as a goal, but the doctrine lacks a methodology to support such integration. Additionally, the JTMD focus appears to be in the active defense pillar, at the expense of the others. As an example, 63 percent of the entire DOD counter-proliferation investment for 1996 was devoted to research and development of active missile defense programs, while attack operations programs were funded at only eight

percent of that level.[14] Active defense weapons are enormously expensive. Thus even with significant investment, limited real capabilities have been acquired.

Joint doctrine is supported by service specific doctrine for TMD. Similar to joint doctrine, service doctrine lacks a concept for creating synergistic effects from the integration of the four pillars. Additionally, service doctrine provides no unique procedures for the conduct of whichever particular pillar the service is most concerned with. According to joint doctrine, active missile defense is a sub-component of air defense, hence the delegation to the AADC. Both the Army and the Navy, the two predominant services in active missile defense, also view missile defense as a sub-component of air defense. Such is evident by the titles of their respective documents concerning active missile defense, US Army Air and Missile Defense Operations and Naval Theater Air and Missile Defense Concept. Attack operations, primarily an Air Force mission, are also considered by joint doctrine to be a sub-component of another mission – offensive counter-air (OCA) operations. The prevailing Air Force perspective, is that, "like maneuver units on the ground, mobile missile launchers are one of many time-critical ground targets…."[15] Simply stated, joint and service doctrines have evolved little and reflect the practices employed by each service during the Gulf War.

I see two principle reasons for the lack of doctrine development for JTMD operations. First and foremost is the perception among many senior military leaders that TBMs pose little to no military threat. General Norman Schwarzkopf highlighted this attitude prior to the Gulf War, "Saying that Scuds are a danger to a nation is like saying that lightening is a danger to a nation."[16] While tactically, this perception may be accurate, the value of TBMs to our enemies lies at the strategic level where effectiveness can hardy be argued. Secondly, the services uniformly blame the inadequacy of C4I systems, and not procedures, for failure

of JTMD operations during the Gulf War. Consequently, the significant improvements in C4I and sensor systems in the past decade, it is believed, will enable Gulf War JTMD procedures to be successful in the future. Unfortunately, inadequacy of C4I systems was only part of the problem during the Gulf War. The problem of locating and identifying a Scud launcher in 29,000 square miles of Iraqi desert was (and still is) like "trying to find a needle in a haystack."[17]

TMD is distinctly different from theater air defense and OCA operations. A decentralized, "one-size fits all" approach, to air and missile defense doctrine is sure to meet with failure in future operations. As stated by JTMD doctrine, success can only be realized by the synergistic effects caused by integrating the four pillars of JTMD. This is not to say that improvements have not been made. Joint and combined exercises over the last decade have provided us with many valuable lessons. As I will argue in the following pages, emerging concepts should be exploited and codified to create the desired synergistic effects of the joint forces engaged in the TMD fight. This is especially true in light of the significant improvements in TBM capabilities and the extensive proliferation of TBMs over the past decade.

Forces - Proliferation and Development of TBMs

While current US joint and service doctrine for JTMD operations has evolved little over the past decade, the threat from TBMs has increased significantly. The US led coalition of the Gulf War faced a short-range ballistic missile (SRBM) threat, characterized by ranges of fewer than 1,000 kilometers. Today, due to extensive advancements in missile technology, the United States and potential coalition members face medium-range ballistic missiles (MRBM), missiles with a range of 1,000 kilometers to 3,000 kilometers. North

Korea, Iran, China, India and Pakistan have all flight tested MRBMs, and the first three nations have already deployed them.[18] As a 2001 National Intelligence Board Estimate of Foreign Missile Development and Ballistic Missile Threat Through 2015 concluded, "A decade ago, the US and allied forces abroad faced threats from SRBMs—primarily the Scud and its variants. Today, countries have deployed or are on the verge of deploying MRBMs, placing greater numbers of targets at risk."[19] In addition to increased range, today's TBMs are also more accurate, more reliable and more lethal than their predecessors. The National Intelligence Council assesses that, "…countries developing missiles also will respond to US theater and national missile defenses by deploying large forces, penetration aids, and countermeasures."[20] The Cato Institute predicts that such a trend is certain to continue into the future, "the future threat will feature missiles with longer range, greater accuracy and increased lethality."[21]

Not only have the capabilities of TBMs increased tremendously since the Gulf War, but also the number of countries possessing TBMs has risen sharply and steadily. Among developing countries alone, at least twenty-four nations possess TBMs and the means to employ them (see Appendix A).[22] There are three primary reasons for the widespread proliferation of TBMs. First, TBMs and related technology are easy to acquire. Nations such as Russia, China, and North Korea eagerly sell TBMs and the associated technology to establish indigenous production capabilities to developing and even rogue nations.[23] The transfer of missile technology is difficult for the United States to detect and monitor. Frequently, the US does not learn of a developing nations acquisition of TBMs until the country test fires a missile.[24] Second, TBMs are relatively low cost weapons. Certainly, a robust fleet of TBMs is cheaper to acquire than a world-class air force. The third and most

attractive feature of TBMs is their strategic nature as discussed previously, which potential enemies can leverage to threaten the interests of the US and regional powers. As the National Intelligence Council states, "Though US potential adversaries recognize American superiority, they are likely to assess that their growing missile capabilities would enable them to increase the cost of a US victory and potentially deter Washington from pursuing certain objectives."[25] In future conflicts, we should expect to face ballistic missile threats with far greater capability than those we have faced in the past.

Forces - US Developments in JTMD

The United States military has not sat idly by during the recent expansion in TBM development and deployment. All four services and the joint community have invested enormous time, effort, and resources toward improving US JTMD capabilities. Most of this energy has been focused on weapons platforms, particularly active defense systems. The Marine Corps has upgraded the Hawk missile system to provide a limited ability against SRBMs. The Army's Patriot missile system has gone through a gradual but comprehensive improvement plan culminating in the deployment of Patriot Advanced Capability-3 (PAC-3) in 2001.[26] Patriot range, firepower, accuracy, and lethality against SRBMs have been greatly enhanced, and the system now possesses a viable (though limited) defense against MRBMs. The Army has also developed the Theater High Altitude Area Defense (THAAD) system, which is projected for deployment in fiscal year 2007. THAAD, when deployed, will provide tremendous protection against TBMs through its ability to engage threats at long ranges, both endo- and exo-atmospheric.[27] Navy Theater Wide (NTW), an Aegis based system, is another highly capable active defense system with exo-atmospheric engagement capability that is also projected to reach the force in 2007.[28] Other active defense systems

predict tremendous capabilities but are still in research and development, such as the Air Force's Air Borne Laser (ABL) and the Army's Medium Altitude Air Defense System (MEADS). The operational element of attack operations has also seen some improvement. Sensor capabilities have been improved far beyond the capabilities of a decade ago, and sensor to shooter targeting time has been reduced by 75%.[29] The C4ISR pillar has evolved tremendously as the military has exploited information and communications technologies. Standardization of data protocol in the implementation of Link 16 is an excellent example.

The biggest draw back to DOD's investment in JTMD over the past 10 years is that doctrine has not evolved to leverage the technological improvements and create the desired synergistic effects of the four pillars. Our approach has been "stove-piped", focused on the last war, and with little attention paid to integration.

Operational Factors – Space and Time

Improvements in forces, by both the US and our potential enemies, have affected the operational factors of space and time to a degree that a JTMD approach that lacks true integration cannot succeed. A cursory analysis of the operational factors of space and time clearly illustrates the problems with current US doctrine. Range increases in both TBMs and US active defense weapons have had a monumental impact on factor space. TBMs, especially MRBMs, now have the ability to threaten far more strategic-level, high-value targets than the US possesses active defense assets to protect. Active defense systems are enormously costly, and even in 2007, capable active defense systems will be in short supply.

The expanded range of TBMs also provides potential enemies with far greater flexibility with respect to their employment. The range of Iraq's Scuds forced them to operate in the deserts of western Iraq in order to pose a credible threat to US forces in Saudi

Arabia. As previously stated, the problem of locating and identifying a Scud launcher in 29,000 square miles of Iraqi desert was like "trying to find a needle in a haystack."[30] Against an enemy far less constrained by range, the "hay stack" grows by orders of magnitude. As graphically depicted in Appendix B, when attacking one specific target, a 1300 km range TBM has almost seven times the operating area available compared with the 500 km range Scud. A 3000 km range TBM can operate in virtually thirty-six times the area of a Scud variant attacking the same target. Obviously, this increased operating area presents a serious reconnaissance challenge to ISR assets and Special Operations Forces (SOF) as well. The "Scud box", time-sensitive target approach to attack operations will not work. It is not feasible or prudent to designate the entire Joint Operations Area (JOA) as a "Scud box".

The increased ranges of current and future active defense systems further complicate factor space. Enemy TBMs, after launch, will likely be engagable by more than one active defense system during the flight of the TBM and at longer ranges than in the past. This was not the case during the Gulf War. Deconfliction of air space and target assignment to the most capable active defense platform are real time challenges that require positive control to prevent fratricide and employ economy of force. Today and into the future, the influences of factor forces on factor space in JTMD operations give a distinct advantage to our potential enemies.

The enemy also has an advantage with regard to factor time in both active defense and attack operations. In future conflicts, regional enemies will possess TBM capabilities in the theater of operations before hostilities even commence. As a power projection force, America will have to deploy active defense assets, most likely from the US. A cost of greater range and overall capability for our ground based active defense systems is size.

PAC-3 and THAAD are large, heavy systems that require enormous strategic lift to deploy. With the exception of NTW, US active defense systems will take weeks, perhaps months, to establish an effective active defense capability in the theater. A smart enemy will focus TBM targeting on theater access denial and may further delay our force build-up.

Once established in theater, active defense operations still face a factor time disadvantage. The short flight time of TBMs present a small engagement window. There is little time to change the orientation or posture of active defense weapons after a TBM has been launched. Deconfliction of weapons platforms, as discussed above, must be accomplished in real time to ensure that the system with the best position and configuration is assigned the engagement. This is further complicated by our potential adversaries employing countermeasures to confuse radars, satellites and other sensors.

Time is also a disadvantage for attack operations. Detection of Scud launchers proved almost impossible during the Gulf War. With the increased space available to threat TBM units, and even in light of our own significant advancements in sensors, we can expect that our first detection of a Scud launcher will come from satellites, once a TBM has been launched. Saddam Hussein's Scud missile units used mobile launcher tactics. Iraqi units could emplace, fire, and redeploy with in thirty minutes. The success of such tactics is well documented and publicized. We should expect our future adversaries to employ similar tactics, leaving attack operations with no more reaction time than in the past. Now, however, the area in which we must react is much larger. This larger area and accompanying airspace must be deconflicted to prevent fratricide. Decisions must be made quickly with the benefit of all available intelligence data.

To minimize these disadvantages in the operational factors of space and time, the US must rely on doctrine. As one can see from the analysis above, executing Gulf War doctrine against new and improved TBM capabilities will not succeed. Through sound doctrine that focuses on complete integration of the four pillars of JTMD, we can leverage the improvements we have made to our own JTMD forces and provide the JFC with reliable protection from enemy TBMs.

Proposed Doctrinal Concept for JTMD

As I have previously asserted, current US doctrine for JTMD lacks the desired and necessary integration of services and operational elements. Active defense is the responsibility of the AADC, but as Joint Pub 3-01.5 states:

> The AADC assists the JFC in determining missions, communications priorities and ROE [Rules of Engagement] for active defense forces based on an assessment and prioritization of forces, critical assets, and population centers to protect. Active defense forces are under the operational control of their component commanders, who employ these forces under the weapons control procedures established by the AADC and approved by the JFC.[31]

The AADC's role in JTMD operations is vague, but for certain, the AADC lacks operational command of active defense forces. Similarly, the JFACC's role in attack operations is also vague. Doctrine dictates that, "The JFC will normally assign responsibility for the planning and execution of JTMD attack operations *outside* of the other component commanders AOs to the JFACC."[32] While the roles of the JFACC and the AADC are ambiguous, the method for integration of the four operational elements is still less defined. In a military organization that rightly stresses decentralized execution, this command structure makes sense. Tactical commanders on the ground usually have the best perspective to make time sensitive decisions, but JTMD operations are different. TBMs are strategic weapons. Current developments in enemy TBM forces have enormously increased the space

in which JTMD operations will be fought while retaining the enemy's comparative advantage in time. Hence, time sensitive decisions regarding the employment of JTMD forces require a theater-wide, strategic perspective. Tactical commanders on the ground cannot, and should not, maintain such a theater-wide perspective.

I therefore propose the creation of a Joint Force Missile Defense Commander (JFMDC), on equal level with the JFACC (see figure 1). JTMD is not a subcomponent of air defense or OCA. It is more complex and encompasses air, land, sea, and even space assets. The JFMDC should be responsible for command and control of JTMD forces theater-wide, and for the execution and integration of active defense, passive defense, attack operations, and C4I. Only then can the JFC create the desired synergy that joint doctrine recognizes as necessary for success.

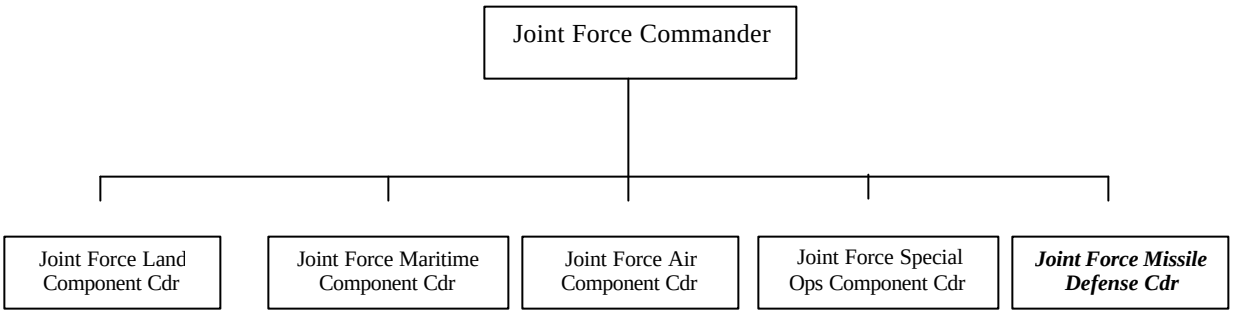

Figure 1 – Proposed Command Structure

Experiments with similar concepts have been conducted. During the joint and combined Exercise Roving Sands '95, command and control of both attack operations forces and active defense forces were collocated in a single headquarters, termed the Theater Missile Defense Force Projection Tactical Operations Center (TMD FPTOC). This allowed, "…an integrated response to attacks by theater ballistic missiles based on speedy distribution

and analysis of intelligence information."[33] The results were excellent. Through increased use of HUMINT and sensors including unmanned aerial vehicles (UAVs), JSTARS, U2 aircraft, and space-based satellites, as well as an integrated C4I system, engagements by active defense systems (actual and virtual) were managed in real time, and "…co-ordinates of simulated Scud launchers passed to aircraft in under 10 minutes."[34] The TMD FPTOC is an Army Headquarters that for Roving Sands 95 integrated the other services and performed JTMD command and control. Doctrinally however, the TMD FPTOC will only integrate Army attack operations forces, such as Apache helicopters and long-range indirect fire systems, in the Land Component Commander's (LCC) area of operations.[35]

Similar experiments in creating an integrated JTMD Headquarters have been conducted in the US Air Force and the US Navy. The results are invariably the same. Integration of the four operational elements of JTMD in a single headquarters does create synergistic effects and improves performance in all four areas. With the recognition of the results from Roving Sands 95 and subsequent joint exercises, the challenge now confronting the joint community is to overcome service parochialism and create an integrated JTMD headquarters at the JFC level. This proposed command structure is simply organizing forces to best accomplish the goal of the current Joint Pub – synchronization of the four "pillars" of JTMD. The benefits to US forces discussed above only begin to scratch the surface. JTMD operations will see a dramatic improvement in all of the operational functions.

Operational Functions

C4ISR: C4ISR is an operational element, or "pillar", of JTMD in and of itself. Consolidating command and control at the JFC level, vice with the component commanders, places command at the operational/theater-strategic level, which is appropriate against the

strategic threat posed by TBMs. JTMD operations will also benefit from an integrated plan for ISR collection assets from the national to tactical levels. The expansion of space in light of our limited ISR assets dictates such integration. Comprehensive, tailored intelligence analysis is the first step in overcoming the space and time disadvantages that US JTMD forces now face. Centralized execution of JTMD operations is only possible with a robust communications infrastructure. Such a capability did not exist during the Gulf War, but today it does.

Operational Fires: Attack operations stand to improve the most from the proposed command structure. An integrated JTMD headquarters at the operational/theater-strategic level will speed timely and accurate targeting information to attack weapons platforms and facilitate rapid deconfliction of airspace with the JFACC to prevent fratricide. Leveraging C4I benefits, the JFMDC will be able to evolve attack operations from purely reactionary (OCA strikes at time-sensitive targets) to seize the initiative from the enemy by disrupting TBM operations and tempo, and performing area access denial. Perhaps the most significant, while indirect, benefit to the attack operations pillar will come from the increased attention caused by the proposed organizational structure. As previously cited, development of attack operations has lagged far behind the resources poured into active defense. Destroying Scud missiles and launchers on the ground is the preferred method of JTMD. A JFMDC will elevate the role of attack operations.

Force Protection: The proposed organization will be able to integrate the multiple active defense systems that will fight on tomorrow's battlefield, a challenge not yet faced outside of simulation exercises. The JFMDC, with operational command and control, will establish a theater-wide active defense plan and ensure seamless coverage for joint forces in

the JOA. This will include coalition members, as more and more of our allies are acquiring and developing active defense systems of their own. Still, active defense forces are few in number, and even those that are deployed cannot operate indefinitely. The JFMDC will manage the posture of active defense systems to maintain continuous protection. The JFMDC will also produce the theater passive defense plan. Toward that end, the JFMDC will advise the component commanders and develop an integrated early warning system that includes coalition forces, local authorities, and the civilian population. As a result, the JFC will enjoy virtually continuous protection of forces from threat TBMs.

Logistics: Working from a joint, integrated JTMD plan, the JFMDC will be capable of prioritizing strategic lift assets in order to bring the right capabilities into theater when the JFC requires them. An integrated active defense plan will allow the JFMDC to direct engagements to the systems with the best opportunity for success. Applying economy of force, especially with such a scarce capability, will enhance sustainment of JTMD forces.

Synchronization: The greatest benefits of the proposed command structure stem from operational/theater-strategic view of the battle space that the JFMDC will bring to US JTMD. We can expect TBMs to be used against us in a strategic manner. By consolidating JTMD forces at the operational level, we can synchronize operational functions throughout the theater and best utilize our forces to overcome the distinct disadvantage we now face in both space and time.

Conclusion

Future enemies are not likely to have either a world-class air force or navy that can compete with those of the United States. Those same enemies are, however, likely to possess a world-class arsenal of TBMs. Current US doctrine to combat these future enemies is

written to fight the Gulf War. It lacks integration and ignores the past decade's changes in forces, space and time. Throughout the history of modern warfare, militaries have changed doctrine and organizations to counter emerging threats. Such is the requirement now. No single pillar of JTMD can be successful when organized in a "stove-pipe" fashion.

Tactical level commanders from all services have recognized the need for consolidation of JTMD operational elements in a single headquarters. Furthermore, they have demonstrated the utility of doing so.[36] There is no guarantee that new doctrine will neutralize the TBM threat, but certainly we should learn from history. There are many parallels between the allied performance against German V2s in World War II and US performance against Iraqi Scuds in the Gulf War. In both cases, missile attacks ended only when large ground forces advanced into enemy territory and controlled the land from which missiles were being launched.[37] Such a performance in the US's next conflict might prove too costly to overcome.

Recommendations

- Doctrinally establish a JFMDC, on equal level as the JFACC
- Assign operational command and control over JTMD forces in a given theater to the JFMDC.
- Organize and staff the JFMDC to facilitate planning and execution of theater-wide passive defense, active defense and attack operations.
- Charge the JFMDC with synchronization of the four pillars of JTMD across all services.
- Aggressively conduct peacetime joint training with rewritten doctrine - the key to future success.

Notes

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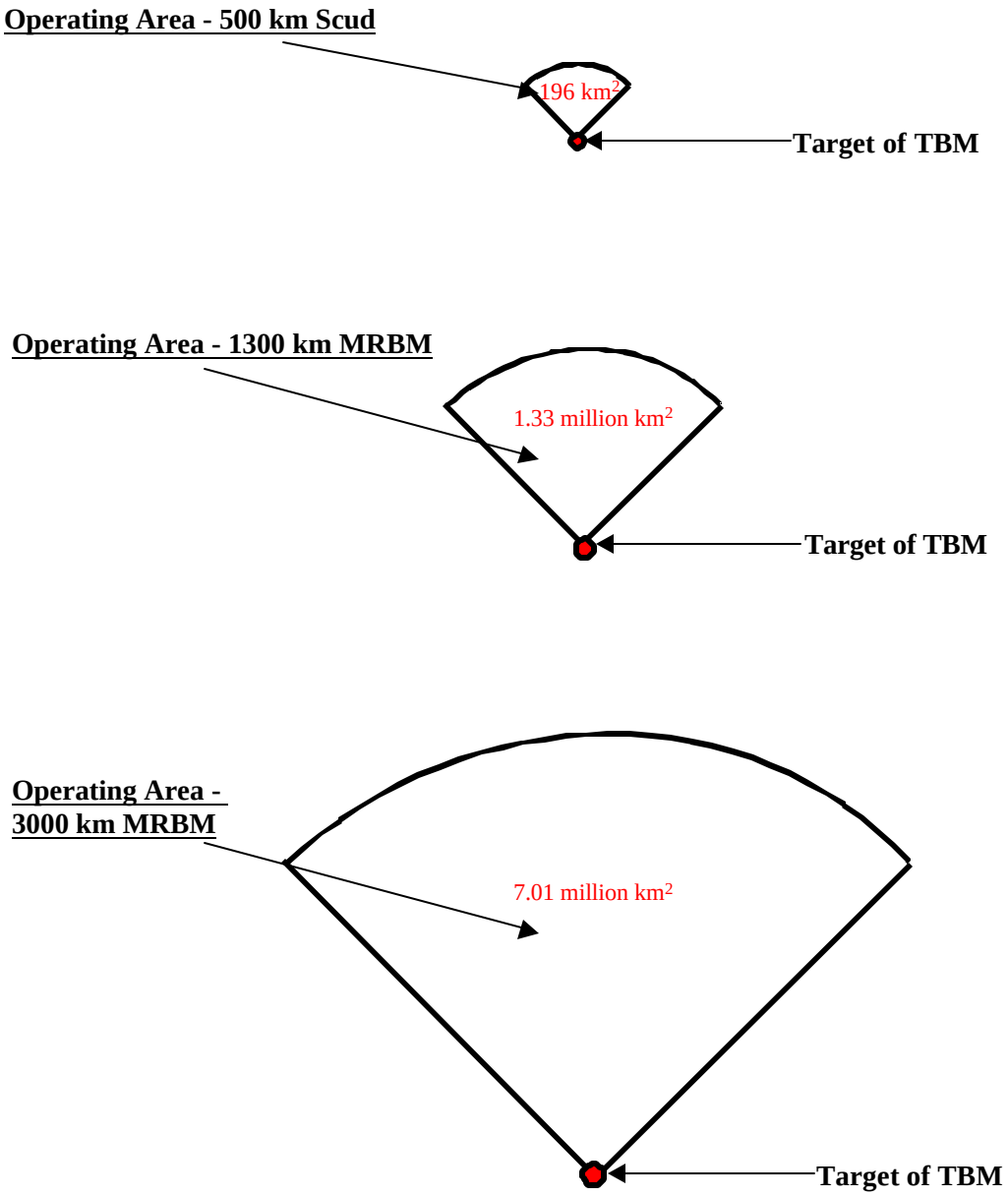
Appendix A: Ballistic Missiles of Developing Countries

Country	System	Status	Range (kilometers)/ Payload (kilograms)	Source
Afghanistan	Scud-B	O/U	300/1,000	Soviet Union
Argentina	Alacran	D/T	200/100	Consortium
	Condor II	C	800-1,000/500	Consortium
Belarus	SS-21	O	120/250	Soviet Union
	Scud-B	O	300/1,000	Soviet Union
Brazil	MB/EE-150	C	150/500	I
	SS-300	C	300/1,000	I
	SS-600	C	600/500	I
Bulgaria	Scud-B	O	300/1,000	Soviet Union
	SS-23	O	500/450	Soviet Union
Czech Republic	SS-21	O	120/250	Soviet Union
	Scud-B	O	300/1,000	Soviet Union
	SS-23	O	500/450	Soviet Union
Egypt	Scud-B	O/U	300/1,000	Soviet Union
	Scud-100/"Project T"	D	600/500	DPRK/UK/I
	Condor II	C	800-1,000/500	Consortium
India	Prithvi-150	O/P	150/1,000	I
	Prithvi-250	D/T	250/500	I
	Agni	D/T	1,500-2,500/ 1,000	I
Iran	Mushak-120	O/U/P	120-130/500	China/DPRK/I
	Mushak-160	O/P	160/NA	China/DPRK/I
	Mushak-200	D	200/NA	China/DPRK/I
	8610/CSS-8	O/P	150/500	China
	Scud-B	O/U	300/1,000	Libya/Syria
	Scud-Mod.B	O	320/1,000	DPRK
	Scud-Mod.C	O	500/700	DPRK
	Iran 700	D	700+/NA	China/I
	Tondar-68	D	1,000/500	China/I
Iraq	Al-Samoud	D	130-140/300	I
	Al-Hussein	C	650/500	I
	Al-Abbas	C	950/300	I
Israel	Lance	O	125/275	United States
	Jericho I	O/P	650/500	France/I
	Jericho II	O/P	1,500/1,000	France/I
Libya	Scud-B	O/U	300/1,000	Soviet Union
	Al-Fatah	D	200/500	Germany/I
North Korea (DPRK)	Scud-B	O	300/1,000	Egypt/Soviet Union
	Scud-Mod.B	O/P	320/1,000	I
	Scud-Mod.C	O/P	500/700	I
	Nodong	D/T	1,000-1,300/1,000	I
	Taep'o-dong	I/D	1,500+/1,000	I

Country	System	Status	Range (kilometers)/ Payload (kilograms)	Source
North Korea	Taep'o-dong II	D	4,000/1,000	China/I
Pakistan	M-11	Unassembled	290/800	China
	Hatf 2	D/T	300/500	I/France
	Hatf 3	D	600/NA	I/France
	Ghauri	T	1,500/	
Romania	Scud-B	O	300/1,000	Soviet Union
Saudi Arabia	CSS-2/DF-3	O	2,650/2,150	China
Slovakia	SS-21	O	120/250	Soviet Union
	Scud-B	O	300/1,000	Soviet Union
	SS-23	O	500/450	Soviet Union
South Africa	Arniston	C	1,450/1,000	Israel (?)
South Korea	NHK-1	O/P	180/500	United States/I
(ROK)	NHK-2	O/P	180-260/500	United States/I
Syria	SS-21	O	120/250	Soviet Union
	Scud-B	O	300/1,000	Soviet Union
	Scud-Mod.C	O	500/700	DPRK
Taiwan (ROC)	Ching Feng	O/P	100/275	Israel/I
Ukraine	SS-21	O	120/250	Soviet Union
	Scud-B	O	300/1,000	Soviet Union
United Arab Emirates	Scud-B	O	300/1,000	Soviet Union
Yemen	SS-21	O	120/250	Soviet Union
	Scud-B	O/U	300/1,000	Soviet Union

Note: C = cancelled, NA = not available, T = tested, D = under development, O = operational, U = used, I = indigenous program, P = indigenous production.

Appendix B: Effects of Space on Attack Operations



The above graphic depiction shows the relative operating area available to three different threat TBMs, assuming that each threat missile is firing against the same target.